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A Socioeconomic Analysis of Marketing Information Usage Among Ohio Fruit Producers

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ABSTRACT

Farm producers attempt to mitigate risk and uncertainty by utilizing accurate and reliable information. This research attempts to determine whether there are economic and socioeconomic factors which influence the adequacy of information for marketing decisions and improved marketing efficiency. Results are based on a logit analysis of Ohio fruit producers and several factors are shown to influence producers' evaluation of the "adequacy" of their marketing information. Among these factors are age, size, education, and types of information sources. Reported findings have implications for marketing efficiency, particularly if producers' evaluation of information as adequate is positively related to its efficient use.

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Introduction

Farm producers and other firms in the marketing system of agricultural products face increasing risk and uncertainty as a result of structural changes permeating the U.S. and world economy. Inflation, international trade, and U.S. fiscal and monetary policies have become major forces impacting agricultural producers and marketing firms (Dorner; Schmitz). Minimum adjustments in any of these forces can cause accelerated instability and disproportionate change in all phases of agricultural production and marketing. Such recognized linkages between agriculture and national and international policies have increased information demands and led to a host of information products to aid decisionmaking and risk management by agricultural firms. Moreover, these linkages have made it abundantly clear that information is critical for effective management decisions (King and Sonka).

As farm producers use information to minimize their risk exposure or increase their expected income (Bullock, Ray and Thabet), it is instructive to evaluate how well their objectives are met with utilized sources of information. A reasonable hypothesis is that the extent to which information meets producers' objectives is dependent upon characteristics of the information itself as well as characteristics of its actual users. Pertinent characteristics of information are likely to include its cost, timeliness, source and method of delivery, and ease of use. Relevant characteristics of information users are likely to include their educational attainment, economic status, attitudes toward growth and expansion, and their perception of the value of information. This latter factor, user perception of the value of

information, is addressed in this paper.

Specifically, this paper examines the relationship between various socioeconomic characteristics of information users and their evaluation of marketing information as either "adequate" or "inadequate" for decisionmaking. Theoretically, it seems plausible to hypothesize a direct linkage between users' perception of the adequacy of their marketing information and their ultimate use of such information to improve marketing efficiency. However, this study is limited to an examination of the impacts that various socioeconomic factors have on producers' evaluation of their marketing information. Ohio fruit producers are the focus group of this study, but the socioeconomic characteristics of these producers compare favorably with those of fruit producers in the Southern states as well as the wider geographic boundaries of the United States.[1]

Information that has value is expected to reduce uncertainty or the dispersion of probabilities associated with a particular decision (Pope). Thus, producers' evaluation of information as adequate or inadequate is expected to reflect their assessment of its perceived value for improved decisionmaking. Previous research suggests that information has considerable economic value in food and produce marketing (Heien, 1980; Ward, 1982). For example, Ward found price adjustments along various points of the marketing chain to be a function of the quality and timing of information. Because wholesale markets could assimilate information more readily than shipping point or retail markets, wholesale markets tended to be price leaders for

[1]As examples, Ohio and Tennessee have similar sized peach crops; Ohio and North Carolina have similar sized apple crops; and the average size of an apple farm in Ohio total 1,700 trees versus 1,669 for the U.S.

fresh vegetables (Ward). This finding, if applicable to other specialty commodities, suggests that information can play a significant role in enhancing producers' revenue and profitability. Hence, an understanding of the attributes which influence producers' evaluation of their marketing information as adequate or inadequate is expected to prove insightful for developing an information market to improve marketing efficiency.

Description of Data

A random sample of two-hundred (200) Ohio fruit producers were surveyed regarding their usage of information for decisionmaking. Over one half (118) of the producers returned the survey questionnaire; most of the returned surveys (80) were complete and usable. Of the 38 incomplete surveys, four producers refused to complete the questionnaire, and the remaining 34 were no longer producing fruit. Primary commodities represented in the sample were apples, peaches and grapes. Sample statistics for peaches and grapes compare favorably with state averages, while those for apples are biased downward. Twelve percent of the state's apple producers were included in the sample and they accounted for 8.3 percent of the 1987 apple production. By contrast, 12.8 and 28.1 percent of peach and grape producers were included in the sample and they produced 12.2 and 26.3 percent of the state's 1987 production of these commodities, respectively. Large apple producers were underrepresented in the sample because the sampling population was drawn from a 1982 population base which did not reflect an 80 percent increase in the largest class of apple producers between 1982 and 1987. Minor commodities included in the sample were blueberries, cherries, melons, nectarines, pears, plums and strawberries.

Approximately 40 percent of Ohio fruit producers in the sample obtained a college education, and a larger number (53 percent) obtained some high school education (Table 1). Age ranged from 25 to 78 years, with mean age being 54 years. Over 67 percent of these fruit producers planned to expand or maintain the current size of their fruit business, while 32 percent expected to reduce their current operation or retire from fruit production. Fruit production was the sole occupation of the majority of producers, but 42 percent were employed in occupations outside their fruit business.

The survey instrument included several questions regarding the usefulness of information sources for fruit production and marketing decisions. Farmers were instructed to rank the usefulness of twenty-two (22) information sources using the criteria VERY USEFUL, USEFUL, NOT USEFUL, and DO NOT RECEIVE/USE (Table 2). Specialized Fruit Magazines and Other Fruit Producers have combined USEFUL and VERY USEFUL rankings of 88 and 84 percent, respectively. Other highly ranked information sources included USDA and Government Publications, Cooperative Extension Service, Ohio Agricultural Statistics, and General Fruit Magazines. Information sources with very low rankings included Computerized Information Services, National Newspapers, and Marketing Consultant Services. Indeed, these latter sources were not subscribed to by most fruit producers.

Adequacy of Marketing Information

The survey questionnaire asked fruit producers to evaluate the adequacy of their current information sources for decisionmaking. Four types of information were identified: marketing, production, financial and weather. Producers were instructed to evaluate each of these as "adequate" or

"inadequate". Producers' evaluations of these sources are expected to reflect their knowledge and perceptions of the usefulness of the information contents for decisionmaking. That is, it is hypothesized that the explicit dollar cost does not bias the evaluations. Survey results show that producers spent an average of $217 for information products in 1987. These expenditures exclude those for computer hardware.

To the extent that expenditures for information sources are a measure of information gathering and selection from among information products, fruit producers' information purchases are consistent with Kihlstrom's corollary that there is little demand for expensive information products (p. 116). Also, the observed pattern of information acquisition seems consistent with the proposition that producers no longer subscribe to an information source whose net value (gross value less cost) has been assessed as inadequate. Only 56.9 percent of the producers ranked their marketing information as "adequate". By contrast, production, weather and financial information were ranked "adequate" by 83.6, 80.8 and 64.3 percent of producers, respectively.

Model Specification

Fruit producers evaluated their marketing information as either adequate or inadequate. These observations are coded "1" and "0", respectively, and are used as the qualitative dependent variable in this study. Specifically, a logit model is specified and estimated using maximum likelihood procedures. The logit model is based on the cumulative distribution function and yields results which are not sensitive to the distribution of sample attributes. That is, the results are meaningful and appropriate whether the explanatory variables are (1) multivariate normally distributed, (2) independent and

dichotomous zero-one or (3) multivariate normal and dichotomous (Press and Wilson).

Other frequently used specifications for analyzing qualitative dependent variables are the linear probability and probit models (Miller and Hay; Capps and Kramer; Pindyck and Rubinfeld). Pindyck and Rubinfeld have shown that maximum likelihood estimation of the linear probability model can provide estimates quite similar to the maximum likelihood estimation of the probit and logit models. However, estimates from the linear probability model are generally biased, inefficient, and inconsistent with a unit prediction range. Both the probit and logit models can be specified to overcome these statistical problems. While there is little empirical basis for discriminating between the logit and probit models, this study is limited to the logit model because of its popular use in applied studies of agricultural economics.

Several factors are hypothesized to influence fruit producers' evaluation of their information adequacy. Among these are the type of marketing information sources utilized, size of fruit farm, ownership structure, employment characteristics, educational attainment, and age. As enumerated in Table 3, fruit producers obtain marketing information from five (5) categories of information sources. These categories are defined as binary variables and used to explain producers' perception of their marketing information adequacy. Fruit producers were asked to identify which of the 22 information source categories were MOST VALUABLE, SECOND MOST VALUABLE and THIRD MOST VALUABLE when making marketing decisions. The binary variables in this analysis are constructed from these responses. BROADCAST takes on a value of 1 if a broadcast information source (radio or television) is

indicated in any of these three responses. Similarly, DAILY, PERIODIC, FRFARM, and PROF take on values of 1 if responses to any of the three questions correspond to an information source in the named category. Thus, for an individual, as many as three (but as few as one) of these binary variables may take on values of one.

Since the enumerated sources are valuable marketing information sources for decisionmaking, each category of information is hypothesized to be a significant explanatory factor of marketing information adequacy. Conceptually, each category of information should increase the probability of producers evaluating their marketing information as adequate. That is, the marginal value of information is expected to be positive.

Risk and uncertainty are hypothesized to increase with farm size (sales). Moreover, producers' ability to manage risk or willingness to bear risk also is likely to be directly related to farm size. That is, size is likely to reflect producers' past success in managing risk. Additionally, risk is somewhat minimized by the marketing strategies utilized by larger fruit producers. For example, larger apple producers market through wholesalers, road-side-markets, processors and retailers (Uchida). Smaller apple producers, on the other hand, often rely entirely upon a single outlet. Since increased diversification and larger size typically require more and better information, larger producers are expected to have higher evaluations of their marketing information.

Age is hypothesized to be positively related to the probability that producers evaluate their marketing information as adequate. Because producers are expected to become more risk averse with age, it is hypothesized that they demand more and better information to diminish risk. Furthermore, through the

information acquisition process, older producers acquire experience in discriminating among information sources with inadequate information. By contrast, education is hypothesized to be negatively related to producers' evaluation of their marketing information adequacy. Education is a form of human capital which should serve to enhance producers' understanding of the complexities of the marketing system and lead them to demand improved marketing information. For example, higher education may interest producers in such marketing techniques as futures and options marketing. However, since new marketing techniques are generally associated with greater uncertainties, it seems reasonable to hypothesize that educated producers with a high propensity to try new marketing techniques are likely to have lower evaluations of their marketing information (Kihlstrom).

Multiple ownership of fruit enterprises allows for management specialization and provides more management time in total to collect and interpret data and information. As a consequence, this ownership structure is hypothesized to increase the probability that producers will evaluate their marketing information as adequate. By contrast, part-time employment outside the fruit enterprise is likely to constrain producers' available time for information assimilation and lead to lower evaluations of their information adequacy. Alternatively, producers with off-farm employment may face lower enterprise risk from inefficient marketing decisions and therefore may be less concerned about the overall quality of their marketing information. This latter scenario is especially plausible for specialty crop producers, since they have higher off-farm income than other groups of farm producers.

All of the described relationships and variables are captured in a logit model, expressed as:

$$LOG\ (P/1-P) = B_0 + B_1\ AGE + B_2\ SALES + B_3\ DAILY + B_4\ PERIODIC + B_5\ OFRPROD + B_6\ EDUCATE + B_7\ PTIME + B_8\ MOWNER + B_9\ BROADCAST + B_{10}\ PROF + U$$

where LOG (P/1-P) = Log of the probability (P) of a marketing information adequacy (MKTADEQ) ranking relative to an inadequate ranking,

AGE = Age in years of the respondent,

SALES = Fruit sales measured in thousand of dollars,

DAILY = 1 if daily information sources are important; 0 otherwise,

PERIODIC = 1 if periodic sources are important; 0 otherwise

OFRPROD = 1 if other fruit farmers are important; 0 otherwise,

EDUCATE = 1 if some college education; 0 otherwise,

PTIME = 1 if employed outside fruit enterprise; 0 otherwise,

MOWNER = 1 if multiple owners of fruit enterprise; 0 otherwise,

BROADCAST = 1 if broadcast information sources are important; 0 otherwise,

PROF = 1 if professional information sources are important; 0 otherwise,

U = error term.

Maximum likelihood estimates are derived and these results are discussed in the next section.

Empirical Results

The maximum likelihood estimates of the logit model are shown in Table 4. Two variables, BROADCAST and PROF, were dropped from the final model because their standard errors were more than nine (9) times their coefficients

(both positive).[2] Also, with these variables included, the likelihood ratio test for the overall model was significant only at the .10 level. Excluding these variables led to an the overall model significance at the .05 level and most parameters were signed as hypothesized (Table 4). Approximately 74 percent of the observations are correctly predicted and all but three (3) of the parameters are statistically significant at the .10 level or better (one-tailed t-tests). With BROADCAST and PROF included in the model, 75 percent of the observations were correctly predicted. In the final model, both "0" and "1" observations are predicted with above 70 percent success (Table 4).

The probability of evaluating marketing information as adequate increases with age. Each year of increase in age leads to a change of .01 in the probability of an adequate evaluation for marketing information. Several factors are likely to account for this relationship. Older producers often have better marketing information sources or accumulated years of experience which partly compensate for formal information sources. For example, older and more experienced apple producers in this survey typically used a larger number of marketing outlets (e.g., wholesale, retail, roadside, etc.) and produced a larger number of apple products (e.g., fresh, cider, juice, jelly, etc.). They also tended to be more highly diversified across fruit commodities.[3]

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[2] It is recognized that dropping relevant variables could bias the parameter estimates. However, excluding these variables led to almost no change in the magnitude of the parameter estimates, but to significant reduction in their variances.

[3] This diversification among marketing methods, commodity type and product form should reduce both price and yield risk exposure, and thus may reduce the individuals' demand for information for risk management purposes.

Additionally, it seems reasonable to conjecture that older and more experienced producers have better marketing relationships with commodity buyers. More specifically, forward contracting is likely to be positively correlated with age and experience and, as a result, marketing price risk can be diminished for older producers. Indeed, insufficient information on factors contributing to market price variability may be a primary factor causing producers to evaluate their marketing information as inadequate. This suggests that both improved marketing information and better marketing tools can serve to enhance marketing efficiency. Since forward contracts are not readily available or always feasible for producers of fruits for fresh marketing, improved marketing information seems to be a more viable option for gaining marketing efficiency among producers of fruits for fresh marketing. Both improved marketing information and better marketing tools (forward contracting), however, are likely options for achieving greater marketing efficiency for processed fruit producers. Because forward contracts historically have been based on producers' previous performance in meeting product and market specifications, collective marketing through a cooperative (e.g., marketing associations) is an option which could improve marketing efficiency.

Sales are not a statistically significant factor influencing producers' evaluation of the adequacy of their marketing information. The negative sign, contrary to a priori expectations, suggests a decline in the probability of an adequate evaluation as sales increase. Perhaps rising sales suggest more risk exposure (greater potential losses) and a possible need for more accurate and reliable information. Assuming that such information is obtained through greater expenditures, it seems reasonable to expect larger producers to spend

more on information sources. Implicit here is the assumption that the value of information can be inferred from information expenditures.

Assuming expenditures on information sources represent information gathering, several tests were conducted to see if any relationship existed between farm size and information expenditures. These tests included a simple correlation test between SALES and total information expenditures (TEXP), a t-test of mean differences for TEXP between larger and smaller producers, and an OLS regression of SALES on TEXP. All test showed a positive but statistically insignificant relationship between the two variables, suggesting that information expenditures are not an appropriate measure of producers' demand for and use of information.

Fruit producers' evaluation of marketing information as adequate tended to be inversely related to their receipt of DAILY information sources. These information sources lowered the probability of an adequate evaluation by .13. This parameter estimate suggests that the marketing information content of DAILY information sources is less than adequate for decisionmaking. Stated differently, producers who rely on DAILY sources for their marketing information still find these sources inadequate for marketing decisions. Local Newspapers, for example, are likely to be inadequate in their coverage of market conditions pertaining to prices and product movement.

Periodic information sources, which consist of such publications as Specialized Fruit Magazines and Commercial Newsletters, raise producers' probability of evaluating their marketing information as adequate. As estimated, this probability is raised by .33 for PERIODIC users versus nonPERIODIC users. This suggests that these information sources provide the type of information that producers seek and utilize in their marketing

decisions. Statistically, other fruit producers (OFRPROD) are revealed to be the most important information source for evaluating marketing information as adequate. The high significance of OFRPROD could have been hypothesized because this information source is likely to be more relevant to the decision at hand than many of the listed information sources. Additionally, OFRPROD are likely to provide information which is more timely than that provided by the other information sources.

The probability of evaluating marketing information as adequate is shown to decline with education. It is lowered by .16 for college-educated versus noncollege-educated producers. This suggests that education raises producers' knowledge and awareness of the complexity of the marketing system and leads them to demand more accurate and reliable information. Producers with off-farm employment are revealed to have lower perceptions of their marketing information adequacy. Although the parameter estimate is statistically insignificant, its negative sign suggests that off-farm employment raises producers' opportunity cost of time and their subsequent demand for more useful information. The negative sign of this parameter also helps to explain the declining demand for information provided by the Cooperative Extension Service, particularly information dissemination to audiences in formal settings.

Multiple ownership of fruit operations is shown to increase the probability of evaluating marketing information as adequate. A reasonable interpretation is that multiple ownership means more total management time to devote to the information gathering process. However, even if multiple ownership is necessitated by expansion which requires more management time, it seems plausible to conclude that it is a form of ownership which raises

producers perceptions of their marketing information adequacy. Simply put, multiple ownership facilitates the decisionmaking process with respect to marketing fruits.

Summary and Conclusions

Analyses of survey results indicate substantial differences in the sources of information utilized by Ohio fruit producers. Thirteen of the twenty-two information sources (Table 2) were evaluated as either very useful or useful for decisionmaking by over half of the producers. Information sources most useful were Specialized Fruit Magazines and Other Fruit Producers. Least useful sources were Computerized Information Services and Brokerage Firms (Table 2). These latter two sources suggest that fruit businesses are neither highly computerized nor very dependent on professionals (other than Salesmen) for information. Kihlstrom's analyses would suggest that producers have low evaluations of computerized information because this technology is not perceived to contribute to effective decisionmaking. An extrapolation of Kihlstrom's analysis also suggests that fruit producers' relatively low evaluation of professionals is due to relative price differences between this source and other, more familiar sources.

The multivariate analyses show three categories of information to be insignificant in influencing the probability of producers' evaluating their marketing information as adequate: DAILY, BROADCAST, PROF (the latter two dropped from reported results). The insignificance estimates suggest that the overall value of these sources for marketing information is limited, relative to that obtained from PERIODIC and OFRPROD information sources. Additionally, size of fruit farm (SALES) and PTIME were also insignificant explanatory

variables. The probability of evaluating marketing information as adequate was estimated to increase with age. This estimate is consistent with a priori expectations, but because of the high correlation of age and experience, this parameter estimate may be capturing some of the effect of experience. Also, age is likely to reflect some of the marketing mechanisms which have favored older producers. For example, forward contracts have been more readily available to older producers who have established relationships with buyers of their commodities. Use of such contracts could diminish producers' risk and enhance their evaluations of their marketing information. Younger producers, with no experience in meeting market-specification contracts, could possibly improve their marketing efficiency and returns through collective marketing and improved communication with larger producers and produce buyers.

The results of this study have several implications with respect to the Cooperative Extension Service. These findings suggest a need to target information to selected groups. Perhaps policy outlook meetings should not be packaged and delivered as though there is a homogenous audience state-wide, but presented as a series of different meetings for specified groups. Results also suggest a need for better communication and understanding between information providers and information users. Information is likely to be of greater value under alternative design and delivery methods. Producers with off-farm employment, for example, might have a higher preference for written information sources than for orally presented information. That is, the higher opportunity cost of time is likely to impact the receptivity of off-farm workers to formal presentations. As extension budgets continue to shrink, clearly the agricultural community will have to rethink its traditional delivery of information services to farm producers. This study identifies several socioeconomic factors which could offer some guidance.

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Table 1. Selected Economic and Socioeconomic Characteristics of Ohio Fruit Producers: Results from a 1987 Survey

Characteristic	Percent	Characteristic	Percent
AGE (years)		BUSINESS PLANS	
Under 30	2.6	Expand Size of fruit Business	24.7
30 to 44	20.5	Maintain Current Size	42.8
45 to 54	28.2	Reduce Size of Fruit Business	10.4
55 to 64	26.9	Retire from Fruit Business	11.7
Over 64	26.9	Exit Fruit Business for Reasons other than Retirement	10.4
FRUIT BUSINESS EXPERIENCE (years)		MANAGEMENT POSITION	
Less than 15	26.0	Sole Owner	67.1
15 to 29	32.4	Equal Participant	11.8
30 to 39	16.9	Senior Participant	17.1
More than 39	24.7	Junior Participant	3.9
FRUIT SALES ($000)		EDUCATION	
Less than $10	29.4	Less than High School	6.5
$10.1 to $25	28.0	High School	53.2
$25.1 to $99	17.6	College	32.4
$99.1 to $130	13.2	Graduate Training	7.9
Above $130	11.8		
OFF FARM EMPLOYMENT			
Some	42.3		
None	57.7		

Table 2. Information Sources for Farm Decisionmaking: Distribution of Relative Importance, Ohio Fruit Producers, 1987.

Information Source	Very Useful	Useful	Not Useful	Do Not Receive
	Percent			
Specialized Fruit Magazines	51.4	36.5	4.1	8.1
Cooperative Extension Service	42.1	36.8	10.5	7.9
General Fruit Magazines	33.8	41.9	8.1	16.2
Other Fruit Producers	30.7	53.3	5.3	10.7
Local Newspapers	25.0	40.8	31.6	2.6
USDA and Government Publications	21.6	59.5	8.1	10.8
Ohio Ag. Statistics Newsletters	21.3	57.3	13.3	8.0
Commercial Newsletters	20.5	47.9	4.1	27.4
Agricultural Newspapers	18.1	41.7	16.7	22.2
Salesmen	16.2	50.0	17.6	16.2
Radio Reports	10.5	42.1	35.5	11.8
Tax Preparer	9.7	31.9	29.2	29.2
Certified Public Accountant	9.6	27.4	31.5	30.1
Local Market Reports	9.5	41.9	23.0	25.7
Television Reports	5.5	52.1	28.8	13.7
Marketing Consultant Service	2.8	12.7	19.7	63.4
Brokerage Firm	2.8	6.9	33.3	56.9
Insurance Agent	1.4	18.3	52.1	28.2
Lender	1.4	13.7	37.0	47.9
Attorney	0.0	16.9	40.8	42.3
National Newspapers	0.0	12.5	30.6	56.9
Computerized Information Services	0.0	5.6	22.2	72.2

Table 3. Information Sources Evaluated as Most, Second Most and Third Most Important for Marketing Decisions.

Source	MOST VALUABLE		SECOND MOST VALUABLE		THIRD MOST VALUABLE		TOTAL VOTES CAST	
	N	%	N	%	N	%	N	%
Daily								
Local Newspapers	14	19.7	2	2.8	4	5.8	20	9.43
National Newspapers	2	2.8	0	0.0	0	0.0	2	0.94
Computerized Info. Services	0	0.0	0	0.0	0	0.0	0	0.00
Total	16	22.5	2	2.8	4	5.8	22	10.37
Broadcast								
Radio Reports	0	0.0	3	4.2	1	1.4	4	1.89
Television Reports	0	0.0	1	1.4	3	4.5	4	1.89
Total	0	0.0	4	5.6	4	5.8	8	3.78
Periodic								
General Fruit Magazines	0	0.0	6	8.3	8	11.6	14	6.60
Specialized Fruit Magazines	16	22.5	8	11.1	7	10.1	31	14.62
USDA & Govt. Publications	1	1.4	8	11.1	1	1.4	10	4.72
Ohio Ag. Stat. Newsletter	5	7.0	5	6.9	6	8.7	16	7.55
Local Market Reports	4	5.6	3	4.2	1	1.4	8	3.77
Commercial Newsletters	1	1.4	6	8.3	9	13.0	16	7.55
Agricultural Newspapers	0	0.0	3	4.2	4	5.8	7	3.30
Total	27	38.0	39	54.2	36	52.2	102	48.11
Ofrprod								
Other Fruit Producers	13	18.3	19	26.4	4	5.8	36	16.98
Total	13	18.3	19	26.4	4	5.8	36	16.98
Professionals								
Certified Public Accountant	2	2.8	0	0.0	2	2.9	4	1.89
Cooperative Ext. Service	10	14.1	6	8.3	13	18.8	29	13.68
Marketing Consultant Service	3	4.2	0	0.0	0	0.0	3	1.42
Salesmen	0	0.0	0	0.0	5	7.2	5	2.36
Insurance Agent	0	0.0	0	0.0	0	0.0	0	0.00
Lender	0	0.0	0	0.0	0	0.0	0	0.00
Brokerage Firm	0	0.0	1	1.4	0	0.0	1	0.47
Tax Preparer	0	0.0	0	0.0	1	1.4	1	0.47
Attorney	0	0.0	1	1.4	0	0.0	1	0.47
Total	15	21.1	8	11.1	21	30.4	44	20.76
Total	71	100	72	100	69	100	212	100

Table 4. Maximum Likelihood Estimates for a Logit Model of Marketing Information Adequacy.

Variable	Estimates	Change in Probability@	Asymptotic t-Value
Age	0.0491400*	0.00981282	1.60560
Sales	-0.0000028	-0.00000055	-1.13300
Daily	-0.8296100	-0.13140826	-1.17890
Periodic	1.4378000*	0.33844322	1.55220
Ofrprod	1.4069000*	0.33178726	1.96940
Educate	-1.1460000*	-0.16523707	-1.70350
Ptime	-0.6372300	-0.10668286	-0.87748
Mowner	1.1941000*	0.27989764	1.46460
Constant	-3.3891000*		-1.46040

Maddala R-Square	0.2329
Cragg-Uhler R-Square	0.3118
McFadden R-Square	0.1932

Prediction Success Table

		Actual	
		0	1
Predicted	0	19	8
	1	8	26
		27	31

Number of Right Prediction = 45
Percentage of Right Predictions = 73.8

@ Probability changes are calculated at means for the continuous variables, AGE and SALES. Probability changes for all binary variables are evaluated from 0 to 1.

* Indicates significance at .10 level or better, one-tailed tests.